

core cluster of OB stars. Because of its proximity ($d = 500$ kpc), we can resolve the star-forming regions on parsec scales ($1 \text{ arcsec} = 2.4 \text{ pc}$). Using the high-resolution ($R = 45,000$) near-infrared spectrograph, IGRINS, we observed molecular hydrogen emission lines from photo-dissociation regions (PDRs) and $\text{Br}\gamma$ emission line from ionized regions. In this presentation, we compare our data PDR models in order to derive the density distribution of the molecular clouds on parsec scales and to estimate the total mass of the clouds.

[포 IM-03] Radiative Transfer Modeling of EC 53: An Episodically Accreting Class I Young Stellar Object

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We present 2-dimensional continuum radiative transfer modeling for EC53. EC 53 is a Class I YSO, which was brightened at $850 \mu\text{m}$ by a factor of 1.5. This luminosity variation was revealed by the JCMT Transient Survey. The increase in brightness is likely related to the enhanced accretion. We aim to investigate how much increase of protostellar luminosity causes the observed brightness increase at $850 \mu\text{m}$. Thus we modeled the SED of EC 53 both in the quiescence and (small scale) outburst phases, with and without the external heating from the interstellar radiation field (ISRF). We found that the internal protostellar luminosity should increase more to fit the observed flux enhancement if the ISRF is considered in the model.

[포 IM-04] Results of KVN and ALMA observations toward WX Psc

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We present the results of KVN and ALMA observations toward WX Psc (IRC+10011) which is a long-period variable OH/IR star. The SiO masers of $v=1$ and $v=2$, $J=5-4$, and the SiO thermal emission of $v=0$, $J=5-4$ were observed together with $\text{H}_2\text{O } v_2=1$ (232.6 GHz) and continuum emission at ALMA Band 6 in October 2017 (Cycle 5). This observation aims to investigate the physical association between the inner and outer parts of the circumstellar envelope (CSE) swept by the stellar winds, which is very crucial to understand the asymmetric outward motions developed during the evolutionary phases from the asymptotic giant branch (AGB) stars to the planetary nebulae (PNe). The strong SiO maser features and thermal emissions are detected together with the continuum emission in ALMA observation, which imply the elongated morphology of the CSE of WX Psc. While the spatial resolution of about 20 mas in ALMA observation cannot clearly resolve the detailed characteristics of the inner part of the CSE, the Korean VLBI Network (KVN) observations show the spatial distributions of the $v=1$ $J=1-0$, $J=2-1$, $J=3-2$ SiO masers emitted from the inner regions of CSE, which are the complementary to the ALMA results. Therefore, we expect these results reveal how the bipolar features of the 22 GHz H_2O maser are connected to the innermost region of CSE through the dust condensation region, which is closely related to the enormous mass ejection of the evolved stars.

[포 IM-05] A disk around a massive young stellar object (MYSO) revealed by the high resolution NIR spectroscopy

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Massive stars play an important role in terms of their feedback, but their formation process is poorly understood. Direct observational evidence for the formation of massive stars through accretion disks is rare. Hence the detection of disks in massive young stellar objects (MYSOs), if any, could be important to constrain the formation process of massive stars. The inner gaseous disk can be observed by the high-resolution near-infrared spectroscopy. We observed a MYSO, Min 2-62, using IGRINS and detected a double peak feature, which could be an evidence of a rotating disk, in the Bracket and Pfund series lines. We report the preliminary observational results of Min 2-62 with IGRINS.

[포 IM-06] 2 - 5 μm Spectroscopy of Red

Point Sources in the Galactic Center

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We present preliminary results of our long-term (2009-2017) observing campaign using the NASA IRTF at Mauna Kea, to obtain 2 - 5 μm spectroscopy of ~ 200 red point sources in the line of sight to the Galactic center. Point sources in our sample were selected from the mid-infrared images of the Spitzer Space telescope, and include candidate massive young stellar objects, which have previously been identified from our Spitzer/IRS spectroscopy. We show high foreground extinction of these sources from deep 3.1 μm H₂O ice and aliphatic hydrocarbon absorption features, suggesting that they are likely located in the central 300 pc region of the Galactic center. While many sources reveal photospheric 2.3 μm gas CO absorption, few of them clearly indicate 3.54 μm CH₃OH ice absorption, possibly indicating a large dust column density intrinsic to a massive young stellar object.

[포 IM-07] High-Resolution Spectroscopy of Hydrogen Emission Lines around a Herbig star, MWC 1080 with IGRINS

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Using IPHAS H α data, we found bright H α regions inside the elongated ¹³CO cavity around a Herbig star, MWC 1080. To investigate the ionized hydrogen regions and the molecular cavity, we perform near-IR high-resolution spectroscopic of hydrogen Brackett lines and molecular hydrogen lines by Immersion GRating INfrared Spectrograph (IGRINS) observations. We detected broad Brackett line series and sharp molecular lines with various velocity components. We present three ionized hydrogen regions (near MWC 1080A, MWC 1080E, and CO boundary) with different line widths, central radial velocities, and line ratios. We also show two spatially-separate Br γ λ 2.1662 μm peaks near MWC 1080A. To reveal a 3D structure of the cavity around MWC 1080, we try to use the detected sharp molecular lines.

[포 IM-08] Early Chemical Evolution of the Milky Way Revealed by Ultra Metal-Poor ([Fe/H] < -4.0) Stars

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Chemical abundance ratios of ultra metal-poor (UMP; [Fe/H] < -4.0) stars can provide important constraints on the early chemical enrichment of the Milky Way (MW), associated with the nucleosynthesis processes that occurred during the evolution of their progenitors, which are presumably the first generation of stars. Despite their importance, only about thirty UMP stars have been discovered thus far. In an effort to identify such stars additionally, we selected UMP candidates from low-resolution (R \sim 2000) spectra from the Sloan Digital Sky Survey and Large Sky Area Multi-Object Fibre Spectroscopic Telescope (LAMOST), and obtained with Gemini/GRACES high-resolution (R \sim 40,000) spectra of 15 UMP candidates. In this study, we present the results of the chemical abundance analysis of the UMP candidates. Furthermore, we compare the abundance patterns of our UMP stars with those of various metal-poor stars from literature to understand the early chemical evolution of the MW.

[포 IM-09] Characteristic Mass Function of First Generation of Stars Investigated by Extremely Metal-Poor ([Fe/H] < -3.0) Stars

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Even though the initial mass function (IMF) of the first generation of stars played important roles in reionization of the universe, subsequent star formation, and chemical enrichment of the universe, it is still very uncertain. In this study, among the several indirect ways of estimating the IMF of the population III (Pop III) stars, we make use of extremely metal-poor (EMP; [Fe/H] < -3.0) stars in the Milky Way, in order to infer the characteristic mass range of Pop III stars. As the progenitors of many of the EMP stars are known to be Pop III stars, we attempt to construct the characteristic mass range of the progenitors (e.g., Pop III stars) of the EMP stars by comparing their observed abundance pattern of various chemical elements with chemical yields from supernova models.

[포 IM-10] Impact of Interstellar Na on the